

CANDU NUCLEAR

Annulus Seal Metallic Bellows



Serving the CANDU Nuclear Community Worldwide

Thorburn Flex Inc



www.thorburnflex.com

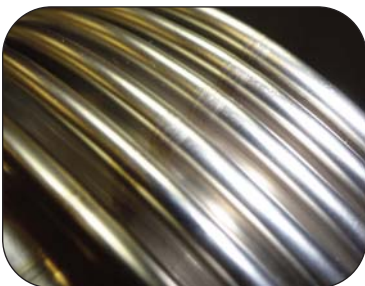
High Quality Custom Flexible Piping Systems

Thorburn Flex offers unmatched capabilities and expertise in applications engineering, design development and manufacture of custom flexible piping systems for CANDU nuclear power plants. Operating under a strategy of global presence, Thorburn Flex has structured and developed a specific CANDU business unit used to service this niche market sector. Through this CANDU business unit, our nuclear products consistently meet and exceed all quality design requirements of our CANDU nuclear reactor business partners.



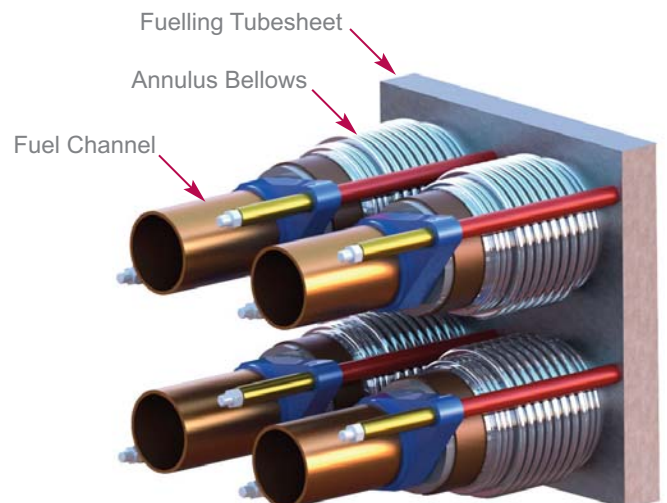
Thorburn's Calandria Fuel Channel Bellows

Thorburn's Precision hydro formed bellows manufactured with various ply thicknesses



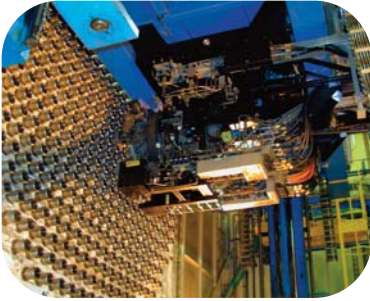
An important component within the calandria fuel channel is the annulus seal metallic bellows which form part of the annulus gas system. Thorburn's annulus seal metallic bellows assemblies are manufactured with multiple ply Inconel SB443

alloy 625LCF and formed using a proprietary hydro forming process. The bellows seams are welded using a fusion welding process without filler metals. The collar plies are fused using resistance welding while the collars are welded to the Bellows Attachment Ring and the Fuelling Tubesheet using GTAW or robotically using an orbital welding process. Thorburn's metallic bellows assemblies are designed and manufactured to ASME B31.1, N285.0, ASME Sec III, Class 2 & 3, as required.



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Calandria Fuel Channel Assembly

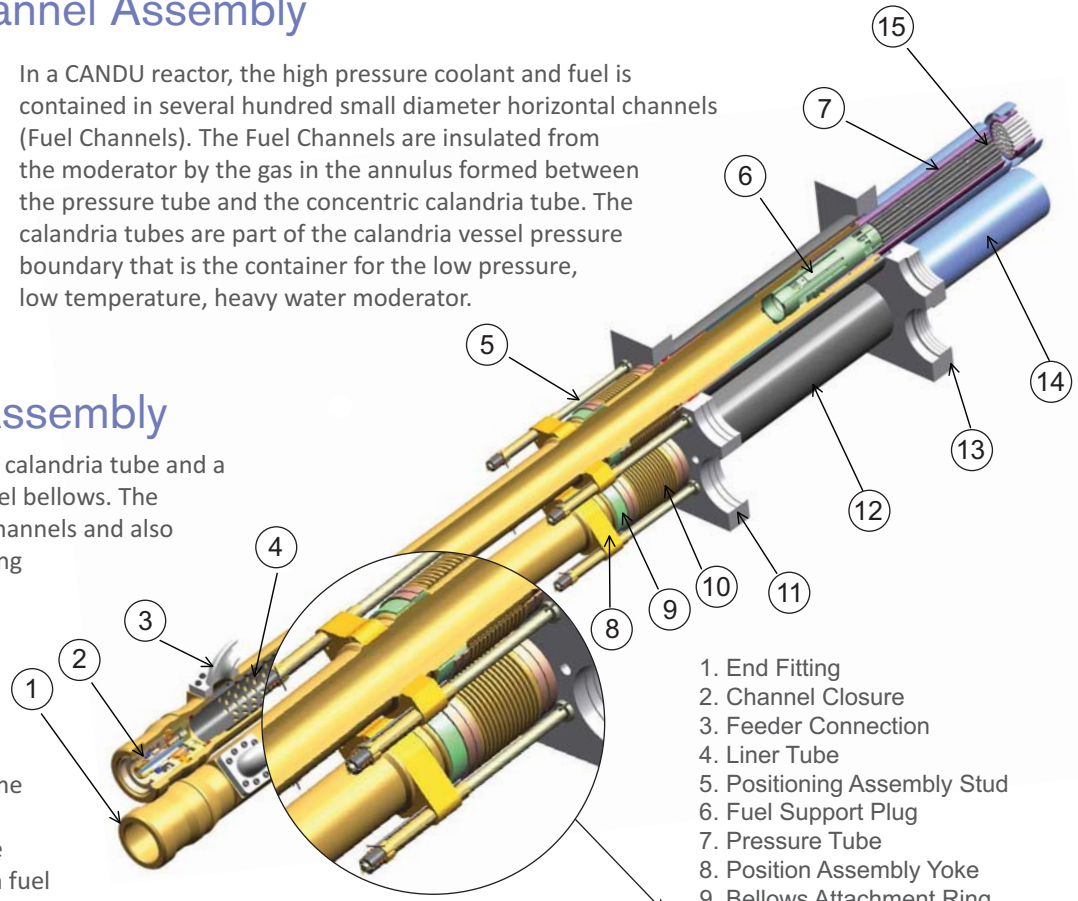


In a CANDU reactor, the high pressure coolant and fuel is contained in several hundred small diameter horizontal channels (Fuel Channels). The Fuel Channels are insulated from the moderator by the gas in the annulus formed between the pressure tube and the concentric calandria tube. The calandria tubes are part of the calandria vessel pressure boundary that is the container for the low pressure, low temperature, heavy water moderator.

Annulus Bellows Assembly

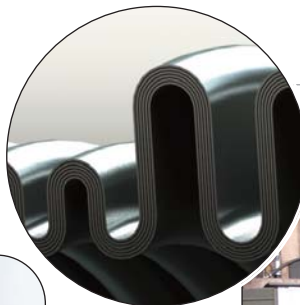
Each end of the annulus between a calandria tube and a pressure tube is sealed by an Inconel bellows. The bellows allow axial motion of the channels and also supports the torque of the end fitting from the feeder piping.

The Advanced CANDU Reactor (ACR) bellows is similar in design to the CANDU 6 bellows and is similarly installed. The material (Inconel 625LCF) is the same as CANDU 6. A small diameter tube welded to the bellows connects the sealed annulus that surrounds each fuel channel to the annulus gas system.

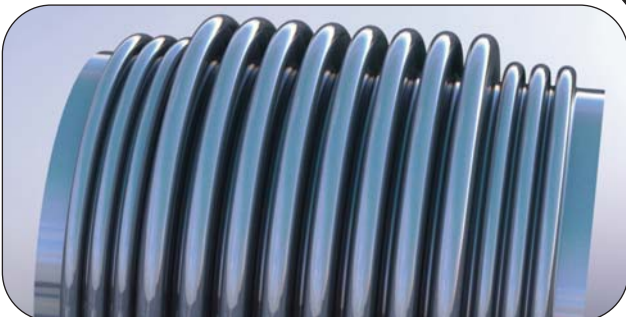


Multi-Ply Bellows

Thorburn uses multi-ply bellows for increased cycle life and when lower forces are required while still maintaining the same pressure capacity. The multi-ply act in unison as far as hoop pressure loading is concerned but act individually when cycle life and forces are calculated. Bellows can be designed with various convolution heights to simplify installation.



Size Range: 10mm - 250mm



Thorburn's 6 ply bellows with various convolution heights



Thorburn's precision hydro forming bellows machine capable of forming from 10mm to 250mm



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CRN for all Canadian Provinces



N285.0 | B51



ASME "U" Stamp (Registered)



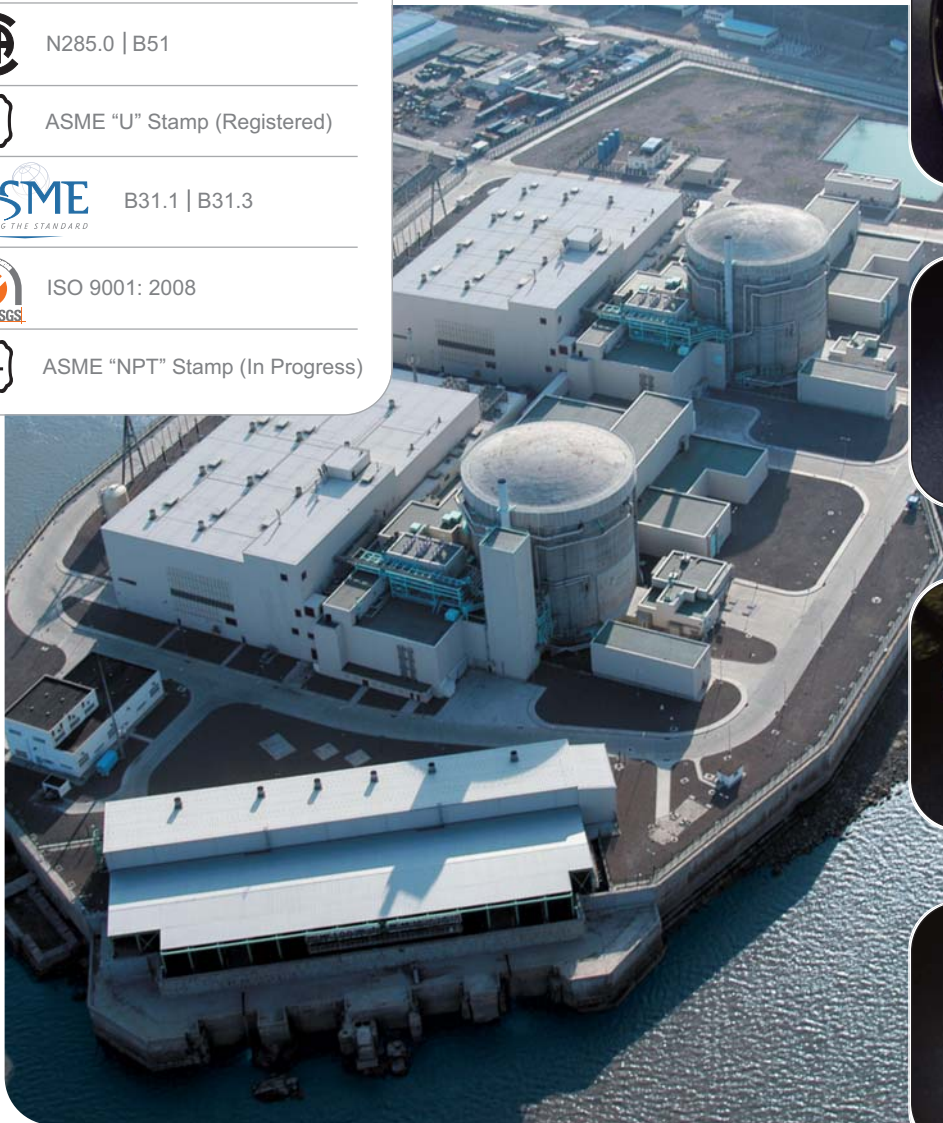
B31.1 | B31.3



ISO 9001: 2008



ASME "NPT" Stamp (In Progress)



Metallic bellows for active drainage systems



Miniature bellows for FM head separator potentiometer



Metallic bellows for Fuel Rod Flask & Rod Cup Seal



Metallic bellows for fuel rod flask limit switch



*Over 50 Years of Flexible Piping Experience
Waiting To Serve You...*